

ENGLISH MACHINE TRANSLATION OF JP 9-21774

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1. Untranslatable words are replaced with asterisks (****).
2. Texts in the figures are not translated and shown as it is.

Translated: 00:25:46 JST 03/11/2008

Dictionary: Last updated 02/15/2008 / Priority: 1. Electronic engineering / 2.

Mathematics/Physics / 3. Chemistry

CLAIMS

[Claim(s)]

[Claim 1] The element part which has the gas sensitive detector part which detects the humidity detecting element which detects humidity on the surface of an insulating substrate and said insulating substrate, and gas, and the heater part which heats said each detecting element, The humidity and the gas sensitive detector element which are characterized by having the lead frame which fixes said insulating substrate and performs electric connection with the exterior, and the junction formed in the back of said insulating substrate which joins said insulating substrate to said lead frame.

[Claim 2] The humidity according to claim 1 and the gas sensitive detector element which are characterized by said junction consisting of two or more island-shape metal membranes and/or glass membrane.

[Claim 3] The humidity and the gas sensitive detector element Claim 1 or given [any 1] in two which are characterized by having the wiring part to which said lead frame carries out electric connection of each electrode part and said each lead frame of said element part by a wire bond or welding by consisting of a dual insertion type.

[Claim 4] The humidity according to claim 3 and the gas sensitive detector element which are characterized by having the holding part which consists of square tube-like resin or ceramics fixed on both sides of said lead frame from both sides.

[Claim 5] The humidity according to claim 4 and the gas sensitive detector element which are characterized by having the covering device for ventilation which consists of resin or ceramics which has [any 1] the vent of the upper part of said holding part, or the lower part, or metal.

[Claim 6] The humidity according to claim 5 and the gas sensitive detector element

which are characterized by having the interception covering device which turns into said holding part of another side of said covering device for ventilation from resin, ceramics, or metal.

[Claim 7] The substrate joining process which joins said insulating substrate to said each lead frame using Qom which connected the peripheral edge of each of said lead frame, and has connected said two or more lead frames to one row, The wiring process which performs electric connection of said each lead frame and each of said element, Humidity given in the inside 1 [any] of the Claims 1-6 characterized by having the energization aging process which energizes simultaneously in said heater part of two or more of said insulating substrates, and is heated in it through said lead frame part linked to said Qom, and the manufacture method of a gas sensitive detector element.

DETAILED DESCRIPTION

[Detailed Description of the Invention]

[0001]

[Industrial Application] This invention relates to the humidity and the gas sensitive detector element which are used for the humidity detection used for the moisture control of electric devices, such as the humidity detection and the gas sensitive detector and the apparatus for general air-conditioning which are used for the automatic cooking function of a microwave oven, and a copy machine, and its manufacture method.

[0002]

[Description of the Prior Art] Various humidity sensors and a gas sensitive detector element are developed, and various the manufacture methods are also examined in recent years. In particular, with the microwave oven with oven, in order to regulate automatically, the sensing element which detects change of the amount of humidity per unit area (absolute humidity) is required, and various methods are developed. As one of the method of the, an oxide semiconductor is heated at a heater and there is a method of detecting change of absolute humidity as change of element resistance. Moreover, an oxide semiconductor is similarly heated at a heater and the method of detecting the concentration change of a little reducing gas as change of element resistance is also developed.

[0003] It explains referring to Drawings below about conventional humidity and a conventional gas sensitive detector element (it indicates to National Technical Report Vol.29 No.3 Jun.1983). Drawing 17 is the partial fracture perspective view of the conventional humidity and a gas sensitive detector element. The humidity of the former [41] and a gas sensitive detector element, the moisture sensitive device which 42 becomes from an oxide semiconductor, The lead frame which support 43 with heat-resistant electroconductive glue, 44 is supported with a metal wire, and 45 is supported with a metal wire 44 in the moisture sensitive device 42, and performs electric connection, The resin base where 46 fixes a lead frame 45, the coil heater with which 47 heats the moisture sensitive device 42, the metallic mesh which 48 encloses the moisture sensitive device 42 with a resin base, and is protected, and 49 are stop rings which fix the metallic mesh 48 to the resin base 46.

[0004] About the conventional humidity and the conventional gas sensitive detector element which were constituted as mentioned above, the manufacture method is explained below. First, the insulating substrate which consists of ceramics in which the electrode and the oxide semiconductor were formed is respectively cut for a chip, and the moisture sensitive device 42 is

formed. Next, the heat-resistant electroconductive glue 43 is used for the cut moisture sensitive device 42, and a metal wire 44 is pasted up. The metal wire 44 with moisture sensitive device 42 is welded to the lead frame 45 with resin base 46. Furthermore, a coil heater 47 is welded to a lead frame 45. Next, the metallic mesh 28 is fixed to the resin base 46 using the stop ring 49. Energization aging processing is performed until it energizes to a coil heater 47 and the characteristics of the moisture sensitive device 42 are stabilized. Then, a characteristic inspection is conducted and humidity and the gas sensitive detector element 41 are completed.

[0005]

[Problem to be solved by the invention] However, with the above-mentioned conventional composition, it had the following problems. Namely, (1) each terminal is having special structure which surrounded the plate-like oxide semiconductor at the coiled heater. The metal wire of thin platinum nature is fixed to each field of the oxide semiconductor formed in plate-like humidity and a gas sensitive detector element. Furthermore, since it is necessary to wire a lead frame and to make the metal wire from the coil heater part which heats an oxide semiconductor cross and all are assembled by welding, In order to automate a manufacturing process, it is necessary to develop an assembly machine and a welder for exclusive use, and since [that management of welding with especially thin metal wire and lead frame is difficult] the yield is bad, fertilization by perfect automation is difficult.

[0006] (2) Since a lead frame is a single insertion type, processing of the lead frame with the state where more than one were connected is possible for a series only to an assembly process. Since it was necessary to divide a lead frame per each element and to energize in a heater part in the next energization aging processing, when carrying out energization aging of a lot of elements, it was difficult to manage whether electric connection between a lead frame terminal and a source end child is performed certainly.

[0007] (3) Since it was sizes other than the standard practice which will be carried out with electronic parts with a common pitch between the terminals of a lead frame and which is carried out, it was difficult to mount using a commercial automatic packaging machine at the same process as common parts.

[0008] (4) The core of parts, such as a moisture sensitive device formed with the oxide semiconductor and a coil heater, was unreserved, and there was a fault on the structure of damaging an element or being easy to generate disconnection of a metal wire etc., at the time of an assembly until the metallic mesh which is a protective cover was fixed to the resin base. moreover, since a protective cover was a dome type metallic mesh, it was easy to generate modification by external force, the internal coil heater was damaged in that case, it obtained now, and there was a fault on structure.

[0009] This invention solves the above-mentioned conventional problem, and forms a heater part on an insulating substrate, and mounting using general-purpose equipment and automation of an assembly are possible for it. The humidity excellent in reliability and mass-production nature, a gas sensitive detector element, and two or more energization aging can carry out that it is simultaneous and easily, raise shortening and reliability of working hours, and aim at offering the manufacture method of humidity and a gas sensitive detector element excellent in the high mass-production nature of the yield.

[0010]

[Means for solving problem] In order to attain this purpose [the humidity according to claim 1 and the gas sensitive detector element of this invention] The element part which has the gas sensitive detector part which detects the humidity detecting element which detects humidity on

the surface of an insulating substrate and an insulating substrate, and gas, and the heater part which heats each detecting element, It has composition equipped with the lead frame which fixes an insulating substrate and performs electric connection with the exterior, and the junction formed in the back of the insulating substrate which joins an insulating substrate to a lead frame. [0011] The humidity according to claim 2 and the gas sensitive detector element of this invention have the composition which junction becomes from two or more island-shape metal membranes or glass membrane in Claim 1.

[0012] In Claim 1 or 2, a lead frame consists of a dual insertion type, and the humidity according to claim 3 and the gas sensitive detector element of this invention have composition equipped with the wiring part which carries out electric connection of each electrode part and each lead frame of an element part by a wire bond or welding.

[0013] The humidity according to claim 4 and the gas sensitive detector element of this invention have composition equipped with the holding part which consists of square tube-like resin or ceramics fixed on both sides of a lead frame from both sides in Claim 3.

[0014] The humidity according to claim 5 and the gas sensitive detector element of this invention have composition equipped with the covering device for ventilation which consists of resin or ceramics which has [any 1] the vent of the upper part of a holding part, or the lower part, or metal in Claim 4.

[0015] The humidity according to claim 6 and the gas sensitive detector element of this invention have composition equipped with the interception covering device which turns into a holding part of another side of the covering device for ventilation from resin, ceramics, or metal in Claim 5.

[0016] [the humidity of this invention according to claim 7, and the manufacture method of a gas sensitive detector element] In humidity and a gas sensitive detector element given in the inside 1 [any] of Claims 1-6 The substrate joining process which joins an insulating substrate to each lead frame using Qom which connected the peripheral edge of each lead frame and has connected two or more lead frames to one row, It has composition equipped with the wiring process which performs electric connection of each lead frame and each element, and the energization aging process which energizes simultaneously in the heater part of two or more insulating substrates, and is heated in it through the lead frame part linked to Qom.

[0017] Here, as an insulating substrate, thickness is 0.3mm, size is 2x3mm, and other insulating heat-resistant ceramic substrates, heat-resisting-glass boards, etc. are used that what is necessary is just the alumina substrate whose purity is 95%, and the insulating board which can bear 1000 degrees C.

[0018] As the quality of the material of a lead frame, it is 42 alloy alloy (iron nickel alloy), and things are made using what was formed at 0.25mm in thickness. Moreover, the nickel plate of 2-3-micrometer thickness is performed on the whole lead frame surface, and gold plate of 2-3-micrometer thickness is further performed for gold plate to the lead frame which comes to the inside of a square tube-like holding part. Although it is inexpensive to have used 42 alloy alloy for the lead frame base material since it is generally used in large quantities as REDO frames, such as IC, now, even for a thickness of 0.25mm to have sufficient rigidity and it is moreover easy to carry out die punching processing As long as there is rigidity sufficient as a lead frame, you may use metal and alloys, such as stainless steel. Moreover, the nickel plate was performed on the surface in order to prevent iron rusting, and to improve adhesion of gold plate. As thickness of a nickel plate, 1-5 micrometers should just be the range of 2-3 micrometers preferably. If connection resilience with metal wire material becomes the case below 1 micrometer has the inadequate adhesion of gold plate, and inadequate, and a possibility of

disconnecting becomes high and exceeds 5 micrometers, although it is satisfactory in characteristics, the expense which plating takes becomes high and is not desirable. It is for preventing the disconnection which becomes easy to generate as a Reason for having performed gold plate only to the lead frame which comes to the inside of a square tube-like holding part when gold-plating at the whole lead frame of humidity and a gas sensitive detector element. Namely, if solder is attached to the gold-plated portion and a continuous duty is carried out in high temperature atmosphere of 150 degrees C or more for about 12 hours The lead portion of solder alloys with gold, the gold plate portion is permeated, and when [which will continue at a long time or high temperature further] it carries out, and a gold plate portion disappears and the metal wire material itself is a gold streak, the metal wire itself is disconnected by alloying with the lead component of solder. The alloy of lead and gold depends this on it being very weak mechanically. The thickness of gold plate is 2-3 micrometers preferably to 0.25-4 micrometers. The case where adhesion strength with metal wire material becomes inadequate in less than 0.25 micrometer may occur and exfoliate, and it is **. When 4 micrometers is exceeded, when the wire bond by a gold streak performs electrical junction, the expense which plating takes may not only become high, but the case where the hardness on the surface of a lead frame becomes inadequate, and connection resilience runs short by gold plate may occur and exfoliate. [0019] moreover, a pore with plurality small to the covering device for ventilation -- it has prepared. It is for protecting an element part by this, at the same time it incorporates the controlled atmosphere and humidity of the element exterior. Moreover, although the vent was prepared in the vent covering device, if the temperature change inside an element is maintained at the small range, you may vacate a vent also for the covering device for interception.

Moreover, you may prepare mesh-like metal as a vent.

[0020] A heat-resistant liquid crystal polymer is used as a resin material of a square tube-like holding part, the covering device for ventilation, and the covering device for interception. Since it is hard to generate gas from resin and a lead frame is not polluted when resin is durable to 250-degree C high temperature and unifies resin and a lead frame with injection molding further by this, the cleaning process after molding can be skipped. If after-molding washing is performed, heat-resistant PPS resin can also be used as a resin material.

[0021]

[Function] The following operations can be done so by this composition. Namely, it sets to the insulating substrate in which the element part which has the heater part which the gas sensitive detector part and each detecting element which detect the humidity detecting element which detects humidity on the surface of (1) insulating substrate, and gas are operated, and is heated in the case was formed. Since junction was formed in the back opposite to an element part and the element part was joined to the lead frame Rearrangement of the parts at the time of an assembly and positioning are easy, common parallel welding equipment and wire Vonda can be used, mounting and full automation of an assembly can be performed, the large number of assemblers can raise reduction and mass-production nature, and the low cost of an element is made. Moreover, since the heater part was laminated on the insulating substrate, mounting is simultaneously [with other element parts] possible, and the yield can be raised, while junction to a lead frame becomes very easy and can reduce an operation man hour especially. By making the pitch of a lead frame into a general-purpose pitch (2.54mm) and a general-purpose half pitch (1.27mm) especially, mounting can also become very easy and the mass-production nature using a sensing element of parts or equipment can also raise it. Since rearrangement of the parts at the time of an assembly, positioning, and energization wiring were ended with 1 time per one unit

quantity, the large number of assemblers was reducible.

[0022] (2) Since a composition surface rises, the central part rises with surface tension, a composition surface product improves and it is uniformly joined to each junction by forming the junction of an insulating substrate from two or more island-shape metal membranes and/or glass membrane, adhesion strength can be improved.

[0023] (3) A lead frame consists of a dual insertion type, and can carry out electric connection of each electrode terminal part and lead frame of an element part easily by a wire bond or welding. Since the check of electric connection, energization aging, etc. can be managed at a time per 1 set connected to Qom when performing two or more energization aging simultaneously, applying voltage to Qom, the defect resulting from the shortage of energization aging by loose connection is prevented, and the yield can be improved.

[0024] (4) by having the holding part which consists of square tube-like resin or ceramics fixed on both sides of a lead frame from both sides Wiring parts, such as a lead frame inside a holding part, an element part and a weld zone, and a wire bond, can prevent being touched by people's hand, can prevent the adhesive aggravation and breakage of a wire bond part after the time of the pollution control and modification prevention of an element, and an assembly, and an assembly, and can improve the yield and reliability.

[0025] (5) By resin or ceramics which has a vent in either the upper part of a holding part, or the lower part, or the metaled covering device for ventilation, while incorporating the controlled atmosphere and humidity of the element exterior, it serves as protection of an element part, and reliability can be secured.

[0026] (6) [with the interception covering device which turns into a holding part of another side of the covering device for ventilation from resin or metal] By making regular the flow of surrounding air of not only the reason of protection of an element part but an element part, and reflecting the radiant heat from a heater part efficiently, a heat insulation effect can be heightened, the stability of a detecting element is secured, and detection accuracy can be improved.

[0027] (7) The insulating substrate joining process which joins an insulating substrate to each lead frame using Qom which connects the peripheral edge of each lead frame and connects two or more lead frames with one row, Since it had the wiring process which performs electric connection of each lead frame and each element, and the energization aging process which energizes simultaneously in the heater part of two or more insulating substrates, and is heated in it through the lead frame part linked to Qom Two or more energization aging can be performed simultaneously, being able to apply voltage to Qom, working efficiency can be improved, the check of electric connection can also be managed at a time, and the defect resulting from the shortage of energization aging by loose connection can be prevented.

[0028]

[Working example] One work example of this invention is explained below, referring to Drawings.

[0029] Drawing 1 (a) is the perspective view of the humidity in one work example of this invention, and a gas sensitive detector element, drawing 1 (b) is an isomerism solution perspective view, and drawing 2 is the front view showing the state where the compound sensor chip inside the humidity in one work example of this invention and a gas sensitive detector element was mounted in the lead frame. In drawing 1 and drawing 2, 1 is the humidity and the gas sensitive detector element in one work example of this invention, and is used as a compound sensor for the automatic adjustment functions of a microwave oven with oven. [the humidity and

the gas sensitive detector element 1 which are a compound sensor] The inside is equipped with the below-mentioned compound sensor chip 6 which formed in one chip two kinds of functions of the gas sensitive detector part which detects a development of the humidity detecting element which detects change of absolute humidity, and alcoholic gas, and a concentration change, and also formed in the same chip the heater part which heats a humidity detecting element and a gas sensitive detector part further. 2 is a lead frame according to the standard practice of the pitch between terminals of common electronic parts, and is the dual insertion type for which between terminals was processed into the 2.54mm pitch. The holding part which 3 becomes from square tube-like resin, the covering device for interception which consists of resin with which 4 was attached to the lower part of the square tube-like holding part 3, and 5 are covering devices for ventilation which consist of resin of the shape of a square tube which has the vent attached to the upper part of a holding part 3, and used the heat-resistant liquid crystal polymer as each resin. It is the wire bond which consists of gold with which 6 carries out the compound sensor chip inside humidity and a gas sensitive detector element, and 7 carries out electric connection of the compound sensor chip 6 to a lead frame 2.

[0030] Here, in this example, by using a contour as a quadrangle by square tube-like a holding part 3, the covering device 4 for interception, and the breathability covering device 5, directivity is given and handling nature at the time of a mounting assembly is made easy. The form of a round shape, a hexagon, and other polygons is sufficient as the form of the inside hollow of the square tube-like holding part 3, the covering device 4 for interception, and the breathability covering device 5. Moreover, the crevice was prepared in one side wall of holding part 3 grade so that the polarity (an element part, a heater part, etc.) of the electric connection of a lead frame 2 might become clear.

[0031] Next, the compound sensor chip used for the humidity and the gas sensitive detector element in one work example of this invention is explained using drawing 3 . Drawing 3 is the front view of the compound sensor chip used for the humidity and the gas sensitive detector element in one work example of this invention. The insulating substrate which consists of ceramics to which 8 considers Al_2O_3 as composition, and 9, 10, 11, 12 and 13 are electrode parts which consist of gold printed on the insulating substrate 8. the admiration from which, as for 14, resistance changes in proportion to the concentration change of humidity and alcoholic gas -- the oxide semiconductor which is atmosphere -- The coat glass which forms the filter for the glass for protection with which 15 fixes the oxide semiconductor 14, and 16 removing the alcoholic gas sensitivity of the oxide semiconductor 14 from which resistance changes in proportion to humidity and the concentration of alcoholic gas, and giving only humidity sensitivity, 17 is a cover glass for intercepting the below-mentioned heater part 20 connected to the electrode parts 12 and 13 from an external atmosphere. As a result, the gas sensitive detector part from which 18 detects a development of alcoholic gas and a concentration change, the humidity detecting element from which 19 detects change of absolute humidity, and the heater part in which 20 heats the humidity detecting element 19 and the gas sensitive detector part 18 are formed. That is, voltage is impressed to the gas sensitive detector part 18 by the electrode parts 9 and 10, and alcoholic gas is detected by a change in resistance. Moreover, voltage is impressed to the humidity detecting element 19 by the electrode parts 10 and 11, and absolute humidity is detected by a change in resistance. Moreover, the electrode parts 12 and 13 are the electrodes of the heater part 20.

[0032] The manufacture method of the compound sensor chip 6 used for the humidity and the gas sensitive detector element 1 of the 1st work example of this invention which were constituted

as mentioned above is explained referring to drawing 4 . Drawing 4 (a) is the front view of an insulating substrate showing the electrode part formation process in the manufacture method of the compound sensor chip in one work example of this invention. Drawing 4 (b) is the front view of an insulating substrate showing the element part formation process in the manufacture method of this compound sensor chip, and drawing 4 (c) is the front view of an insulating substrate showing the glass formation process in the manufacture method of this compound sensor chip. First, as shown in drawing 4 (a), in order to form the gas sensitive detector part 18 and the humidity detecting element 19 on the insulating substrate 8, the golden paste was printed, and it calcinated for 30 minutes at 850 degrees C, and the electrode parts 9, 10, 11, 12, and 13 were formed. Next, as shown in drawing 4 (b), in order to form the heater part 20, the paste containing glass frit of ruthenium oxide is printed. in order [and] to form the oxide semiconductor 14 from which resistance changes in proportion to the concentration change of humidity and alcoholic gas -- the ORGANO silica of tin oxide -- sol -- the entering paste was printed and it calcinated at 830 degrees C simultaneously for 1 hour. Furthermore, laser trimming processing adjusted so that the resistance of the heater part 20 might be set to 18×0.1 ohms. Furthermore, as shown in drawing 4 (c), the glass 15 for protection, coat glass 16, and the glass 17 for protection are the same glass altogether. After printing using the glass paste which has the characteristics of glass-transition-temperature [of 600 degrees C], 700 degrees C of softening temperature, and coefficient-of-linear-expansion $60 \times 10^{-7}/K$, it calcinates for 1 hour and 800 degrees C is formed. [0033] Here, as an insulating substrate 8, 0.3mm and size are 2x3mm, and thickness used the alumina substrate whose purity is 95%. Although the inter-electrode gap of the electrode part 9 for gas sensitive detector part 18, the electrode part 10 and the electrode part 10 for humidity detecting element 19, and the electrode part 11 was formed in 0.05-0.5mm, it is good preferably to form at 0.1-0.2mm. It is difficult to carry out gap formation according to printing processes in less than 0.05mm, and when exceeding 0.5mm, the resistance of the gas sensitive detector part 18 and the humidity detecting element 19 is not desirable across the measurable range. Moreover, the thing of glass-transition-temperature [of 600 degrees C], 700 degrees C of softening temperature, and coefficient-of-linear-expansion $60 \times 10^{-7}/K$ was used for the glass used for the glass 15 for protection, coat glass 16, and the glass 17 for protection. moreover, the ORGANO silica of tin oxide -- sol -- composition of an entering paste is shown in (Table 1).

[0034]

[Table 1]

酸化錫 (S n O ₂) のペースト配合比

材 料 名	重 量 %
酸 化 錫	5 3. 0
シ リ カ ゾ ル	7. 0
ア ル ミ ナ ゾ ル	2. 5
2-(2- ETHOXYETHOXY) ETHY ACETATE	3 0. 0
エ チ ル セ ル ロ ー ス	7. 5

[0035] here -- silica -- sol and alumina sol show the effect of the sintering agent of tin oxide. 2-(2-ETHOXYETHOXY) ETHYL ACETATE and ethyl cellulose were used as a vehicle. in addition, the ORGANO silica -- sol may be made to permeate an element directly after paste printing, and may infiltrate oxidation palladium into materials after addition or printing calcination in the state of a chloride as a catalyst.

[0036] The humidity of this example and the manufacture method of the gas sensitive detector element 1 which were manufactured as mentioned above are explained below. Drawing 5 is the front view showing the lead frame connected by Qom in the manufacture method of the humidity in one work example of this invention, and a gas sensitive detector element. In drawing 5, 21 is Qom which connects a lead frame 2 with plurality, and the consecutive processing of humidity and the gas sensitive detector element 1 is collectively made by every Qom 21. The cutting process which cuts the compound sensor chip 6 first as a manufacturing process, and the substrate joining process which welds the compound sensor chip 6 to the lead frame 2 to which the holding part 3 which is resin was attached, The wiring process which connects electrically the compound sensor chip 6 and a lead frame 2 using the wire bond 7 which consists of a gold streak, The terminal part cutting process of cutting a part of Qom 21 and lead frame 2 so that energization aging processing of only a series of heater parts 20 can be performed, The energization aging process which connects a power supply to Qom 21 (refer to below-mentioned drawing 5) of both ends, and heats the heater part 20, The terminal cutting process for removing Qom 21, and the terminal forming process bent in order to insert each terminal of a lead frame 2 in a printed circuit board etc., It consists of a characteristic check process which conducts product inspection, and cover mounting operation which attaches the cover of the covering device 4 for interception, and the covering device 5 for ventilation to a holding part 3 at the last.

[0037] Next, the substrate joining process in the manufacturing process of this example is explained in detail below. Drawing 6 (a) is the rear elevation showing an example of the junction on the back of a compound sensor chip in the humidity and the gas sensitive detector element of one work example of this invention, and drawing 6 (b) is this sectional view. In drawing 6, the insulating substrate in which the element part made 8 form, and 22 were calcinated for 30 minutes at 850 degrees C by printing a golden paste on the square whose form it is the junction in which the back of the insulating substrate 8 was formed, and is 1.8×2.8 mm, and it formed as welding public-funds putt. Since junction 22 is formed by the printer method, it has the form of a crevice where the central part became depressed from the edge as shown in drawing 6 (b). Thereby, on the occasion of welding, since the welding face product became small by this crevice, welding intensity varied or problems, like welding intensity is small on the whole occurred, it inquired by forming the junction of the form made into the aggregate which consists of island shape further in this example. Drawing 7 (a) is the rear elevation showing the junction formed in the compound sensor chip back in the humidity and the gas sensitive detector element of one work example of this invention at island shape, and drawing 7 (b) is this sectional view. 23 is the junction in which the back of the insulating substrate 8 was formed, and was formed as island shape of $\phi 0.4$ mm circle form. [two or more] As a result, when the thing of $\phi 0.4$ mm circle form formed the form where the printing hand swelled in the shape of a lens with the surface tension of the golden paste, the effect of arranging the height of a printing hand was seen. As compared with the 1.8×2.8 mm angle, by welding the insulating substrate 8 to a lead frame 2, welding was ensured, there is little dispersion in welding intensity and the yield of two or more junction 23 which consists of island shape of $\phi 0.4$ mm circle form improved.

[0038] Furthermore, examination of the junction shown by drawing 8 was also performed as

structure of junction. Drawing 8 (a) is the rear elevation showing the junction formed in the compound sensor chip back in the humidity and the gas sensitive detector element of one work example of this invention with glass and gold, and drawing 8 (b) is this sectional view and the sectional view of the junction to which flattening of drawing 8 (c) was carried out. 24 is the glass junction formed in the upper part of the back of the insulating substrate 8, and 25 is golden junction which consists of a golden paste printed by the glass junction 24 which consists of glass. First, as were shown in drawing 8 (a), and the glass used for the back of the insulating substrate 8 which consists of alumina by the glass formation process in the manufacture method of the above-mentioned compound sensor chip was printed and it was shown in drawing 8 (b), gold was printed on it and it calcinated for 15 minutes at 830 degrees C. Next, as shown in drawing 8 (c), the lap of the gold was carried out and the planar state was formed. Thus, as a result of a contact area with a lead frame 2 welding by increasing sharply by making a field flat mechanically, the steep rise of welding intensity was obtained. Moreover, the adhesion strength of the golden junction 25 and the insulating substrate 8 also increased by forming the glass junction 24 between the insulating substrate 8 and the golden junction 25 which are alumina. [0039] Next, the joining process of this example is explained. Drawing 9 is the decomposition cross section showing the humidity in one work example, and the compound sensor chip and lead frame joining process in a gas sensitive detector element of this invention. The back of the insulating substrate 8 in which the compound sensor chip 6 was formed is contacted to a lead frame 2, and the parallel electrodes 29a and 29b are contacted from the lead frame 2 side, and current is sent through a lead frame 2 by the alternator 30, it heats to it, and the gold plate 28 and junction 26 of a lead frame 2 are welded. At the time of welding, the junction 26 in the back of the compound sensor chip 6 was turned upward, the lead frame 2 was placed on it, two parallel electrodes 29a and 29b were contacted from on the lead frame 2, and the alternator 30 performed flow welding for high current. In this example, although the parallel electrodes 29a and 29b were used two, 3, 4, etc. are used simultaneously, and they set up bond strength etc. the optimal, and can reduce working hours etc. Here, what was formed at 0.25mm in thickness is used, using 42 alloy alloy (iron nickel alloy) as the quality of the material of a lead frame 2. Furthermore, the surface performed 2-3 micrometers of gold plate 28 to the lead frame 2 which performs the nickel plate 27 of 2-3-micrometer thickness, and comes the whole to the square tube-like holding part 3 further.

[0040] Next, the lead frame 2 was set up as a wiring process for the compound sensor chip 6 to turn up, and it wired using wire BONDA which can set up a bonding position beforehand and can carry out bonding automatically.

[0041] Next, the energization aging processing process impressed voltage 5V to the Qom part of both ends directly, as shown in drawing 10 , and it performed it by forming the Qom cut section 31. Electric connection of Qom 21 and a power supply was performed by pushing a contact terminal with a spring with a NIRUDO-like tip against Qom 21. This went in order to make connection for a short time and to perform electric connection certainly. Although electric connection was performed by pushing in this example In order to perform electric connection certainly, it may connect with solder or a screw stop may be carried out, but the contact terminal of the type which contacts in the shape of a field is not desirable, when it is easy to generate the loose connection by wear, garbage adhesion, etc., electric connection is repeated like this example and it performs it.

[0042] Terminal cutting and terminal forming were performed using the fixture which cuts a lead frame 2 and Qom 21 collectively, and bends a lead frame 2 continuously. Drawing 11 is the

perspective view showing the state where two or more the humidity and the gas sensitive detector elements in one work example of this invention were arranged in the rail-like fixture by one row. The humidity and the gas sensitive detector element 1 by which forming was carried out after terminal cutting have space in a lead frame 2 and the right-angled direction, as drawing 1 shows, and plurality can be dealt with per one rail by arranging to the rail-like fixture 32. In this example, the humidity of 20 pieces and the gas sensitive detector element 1 were arranged in one rail-like fixture 32, and a characteristic inspection and assembling work were performed as 1 time of a work unit. It is not necessary to perform forming depending on the configuration method and the loading method of the humidity of this example, and the gas sensitive detector element 1.

[0043] Next, a characteristic check process is explained. Characteristics measurement performed electric connection by pushing a contact terminal with a spring with a NIRUDO-like tip against a lead frame 2. This can make connection in a short time, and can perform electric connection certainly. The arrangement direction of the element turned up the direction which can be seen at the time of characteristics measurement. Although the contact terminal was used in this example Since the dual insertion type processed into the 2.54mm pitch which is the standard practice of electronic parts with common form of a lead frame 2 is used, the connector for IC may be used, a lead frame 2 may be fitted in the connector for IC, and characteristics measurement may be performed.

[0044] The comparative experiments of the humidity of this example and the characteristics measurement of the gas sensitive detector element 1 and conventional parallel manufactured as mentioned above were conducted. The alcoholic sensitivity in a gas sensitive detector part was defined as a ratio of the resistance of 1000 ppm atmosphere, and the resistance of 0 ppm atmosphere. The humidity sensitivity in a humidity detecting element was defined as a ratio of the resistance of the atmosphere of 20 degrees C and 90%RH, and the resistance of the atmosphere of 20 degrees C and 65%RH. thus -- carrying out five-piece sample extraction of the humidity and the gas sensitive detector element of this example and conventional parallel which were obtained, and performing characteristics -- the measurement result -- Table 2 and (Table 3) it is shown.

[0045]

[Table 2]

20℃65%RHの時の複合センサチップのアルコール特性データ						
No	0ppm		100ppm		アルコール感度	
	湿度片	アルコール片	湿度片	アルコール片	湿度片	アルコール片
従来例	1	92.6	24.5	88.3	4.12	0.95
	2	62.4	21.2	59.5	3.90	0.95
	3	121.9	29.5	115.2	4.84	0.95
	4	60.1	25.4	57.2	5.43	0.95
	5	68.7	21.1	65.8	4.37	0.96
本実施例	1	173.5	51.1	164.3	9.86	0.95
	2	70.7	28.0	67.4	4.54	0.95
	3	52.8	19.5	49.9	3.17	0.95
	4	59.7	28.8	57.2	5.09	0.96
	5	55.2	19.8	53.4	3.92	0.97
単位	kΩ	kΩ	kΩ	kΩ	抵抗比	抵抗比

[0046]

[Table 3]

アルコール0ppm時の複合センサチップの湿度特性データ						
No	20℃65%RH		20℃90%RH		湿度感度	
	湿度片	ガス片	湿度片	ガス片	湿度片	ガス片
従来例	1	89.9	18.6	82.0	18.7	0.91
	2	89.9	18.3	81.5	17.7	0.91
	3	182.0	18.0	161.2	18.0	0.89
	4	357.0	13.5	322.9	13.5	0.90
	5	95.3	20.9	85.9	20.2	0.90
本実施例	1	526.3	53.2	458.3	49.7	0.87
	2	110.2	14.5	99.1	14.3	0.90
	3	79.2	7.2	71.9	7.2	0.91
	4	88.5	17.6	81.6	17.2	0.92
	5	96.7	27.6	87.1	26.9	0.90
単位	kΩ	kΩ	kΩ	kΩ	抵抗比	抵抗比

[0047] As compared with the thing of conventional parallel, the difference has not produced the ***** gas sensitive detector element 1 of this example in characteristics so that clearly from this (Table 2) result that reaches (Table 3). therefore -- this example compares with conventional parallel -- structural -- an assembly -- easy -- automation of the process could be realized and mass-production nature was able to be raised.

[0048] Next, the installation method of the sensing element of this example is explained,

referring to Drawings below. Drawing 12 shows how to attach the connector 34 for IC on the printed circuit board 33, and insert the humidity and the gas sensitive detector element 1 of this example there. Drawing 13 establishes the through hole 35 which is a through tube in the printed circuit board 33, carries the humidity and the gas sensitive detector element 1 of this example there, and shows how to fix to the back of the printed circuit board 34 by soldering. Drawing 14 establishes a through hole 35 in the printed circuit board 33 made from glass epoxy, installs the humidity and the gas sensitive detector element 1A which have structure without the covering device 4 for interception in this example there, and shows how to fix to the back of the printed circuit board 33 by soldering. In this case, the printed circuit board 33 substitutes for the covering device 4 for interception. Drawing 15 vacates the pore 36 of the size in which the covering device 4 for interception of humidity and the gas sensitive detector element 1B goes into the printed circuit board 33, and shows how to install the humidity and the gas sensitive detector element 1B of this example which has the structure of the lead frame 2 without forming there. Drawing 16 shows how to carry out surface mounting of the humidity and the gas sensitive detector element 1C of this example of structure which bent the terminal area of the lead frame 2 along with the outer wall of a holding part 3 and the covering device 4 for interception to the printed circuit board 33. When the wing for element immobilization may be attached to the covering device 4 grade for interception and it uses it for a microwave oven with oven as other examples, you may use it, opening many small holes in the steel plate of an installation part, making the covering device 5 for ventilation of the humidity of this example, and the gas sensitive detector element 1 make it serve a double purpose, and dropping off covering device 5 for ventilation.

[0049] Thus, it has the following advantages by passing to an assembly process by making into one unit quantity the lead frame with a resin base connected by Qom. [two or more]

[0050] (1) It sets like a welder and working hours are shortened that positioning of compound sensor chip welding should just carry out for every unit quantity.

[0051] (2) In a wire-bonding process, positioning of wire bonding ends the whole unit quantity, since the positions of each lead frame are regular intervals, the bonding of the one unit quantity can be carried out continuously, and working hours are shortened similarly.

[0052] (3) Current is sent through the heater part of a compound sensor chip, applying [as shown in the sign A of drawing 16 , perform terminal cutting for energization aging processing, and] direct voltage to Qom, batch processing is possible, and shortening of working hours can be performed.

[0053] As mentioned above, according to this example, the high installation method of flexibility is possible, since it has flexibility, mass-production nature is raised and a low cost can be realized. The correspondence to surface mounting is also possible especially, and mounting is very easy. Moreover, in the manufacture method, since rearrangement of the parts at the time of an assembly, positioning, and energization wiring were ended with 1 time per one unit quantity, the large number of assemblers was reducible. Moreover, when performing two or more energization aging simultaneously, having applied voltage to Qom, the check of electric connection was able to be managed at a time, the defects resulting from the shortage of energization aging by loose connection were able to decrease in number, and the yield was able to improve remarkably.

[0054]

[Effect of the Invention] According to this invention, the humidity and the gas sensitive detector element which do the following outstanding effects so, and its manufacture method are realizable

as mentioned above. Namely, since junction was formed in the back of an insulating substrate opposite to an element part and the element part was joined to the lead frame in the insulating substrate in which the element part which has (1) humidity detecting element, a gas sensitive detector part, and a heater part was formed Rearrangement of the parts at the time of an assembly and positioning are easy, common parallel welding equipment and wire Vonda can be used, mounting and full automation of an assembly can be performed, reduction of the large number of assemblers and the low cost of an element can be realized, and it excels in reliability and mass-production nature. Moreover, since the heater part was laminated on the insulating substrate, mounting is simultaneously [with other element parts] possible, and especially, junction to a lead frame becomes very easy, an operation man hour can be reduced, the yield is raised remarkably, and it excels in reliability and mass-production nature.

[0055] (2) Since a composition surface rises, the central part rises with surface tension, a composition surface product improves and it is uniformly joined to each junction by forming the junction of an insulating substrate from two or more island-shape metal membranes and/or glass membrane, raise adhesion strength and excel in reliability.

[0056] (3) The wiring part electric connection was carried out by a lead frame consisting of a dual insertion type by each electrode terminal part of an element part, a lead frame, a wire bond, or welding of, Since the check of electric connection, energization aging, etc. can be managed at a time per 1 set connected to Qom when performing two or more energization aging simultaneously, applying voltage to Qom by preparation *****, the defects resulting from the shortage of energization aging by loose connection decrease in number, the yield improves, and it excels in reliability and mass-production nature.

[0057] (4) by having the holding part which consists of square tube-like resin or ceramics fixed on both sides of a lead frame from both sides Wiring parts, such as a lead frame inside a holding part, an element part and a weld zone, and a wire bond, prevent being touched by people's hand, and can prevent the adhesive aggravation and breakage of a wire bond part after the time of the pollution control and modification prevention of an element, and an assembly, and an assembly, and the yield and reliability are high and it excels in mass-production nature.

[0058] (5) By resin or ceramics which has a vent in either the upper part of a holding part, or the lower part, or the metaled covering device for ventilation, while incorporating the controlled atmosphere and humidity of the element exterior, it serves as protection of an element part, and reliability can be secured.

[0059] (6) [with the interception covering device which turns into a holding part of another side of the covering device for ventilation from resin, ceramics, or metal] By making regular the flow of surrounding air of not only the reason of protection of an element part but an element part, and reflecting the radiant heat from a heater part efficiently, a heat insulation effect can be heightened and the stability of humidity and a gas sensitive detector part can be secured, and detection accuracy is high and it excels in the reliability of an element.

[0060] (7) The insulating substrate joining process which joins an insulating substrate to each lead frame using Qom which connected the peripheral edge of each lead frame and has connected two or more lead frames to one row, Since it had the wiring process which performs electric connection of each lead frame and an element part, and the energization aging process which energizes simultaneously in the heater part of two or more insulating substrates, and is heated in it through the lead frame part linked to Qom Two or more energization aging can be performed simultaneously, the reliability of inspection improves, and working hours can reduce remarkably and are excellent in mass-production nature.

[Translation done.]